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TEETOTALISM IN RELATION TO CHEMISTRY AND PHYSIOLOGY.

[The substance of a LECTURE delivered in the Music Hall, Leeds, April 9th, 1851, under the auspices of the Temperance Society, by Dr. FREDERIC R. LEES, F.S.A., Edin., in reply to statements advanced in the Mechanics' Institution, by Dr. EDWIN LANKESTER, F.R.S., Lond. The lecture was heard by a crowded audience with marked attention, and thro'out warmly applauded.]

INTRODUCTION.

GENTLEMEN,—most of you are already aware of the occasion of my addressing you to-night, on the subject announced—"The Harmony of Teetotalism with the Natural Laws of Diet, and with the Theory of Liebig concerning Animal Heat." I say Theory of Liebig, which I am not disposed to dispute, tho' it is quite certain that some of his opinions and statements are not only doubtful, but erroneous. Dr. Lankester, in a course of three lectures, delivered in our Literary Institution, "On the *Natural History* of Plants yielding Food," went out of his way to discuss questions concerning that *non-natural* product—"Alcohol: *its forms*, wine, beer, spirits,"—and to give an "estimate of (them), as articles of diet," professing to correct the chemistry and physiology of the Teetotalers! Had Dr. Lankester furnished us with fresh food for thought—had he shown us that some natural and scientific facts had been overlooked in the theory of our system—we should very respectfully have accepted his suggestions for what they were worth; but, as it is, we are entitled to complain of two things—First, the long and widely-published arguments of the Teetotalers on the very topic of his remarks, are ignored as non-existent, thus conveying the impression to his audience that we were ignorant of what he had got to say, while the fact is, that he was, or affected to be, ignorant of what we had said and written in reply to his adopted hypothesis. Second, there is not, in all his objections, one that is original or new; on the contrary, most of them are very stale, and have been, time after time, shown to be equally 'flat and unprofitable.' Indeed, had the objections I have to notice appeared in any of the usual channels for such things, I must confess that I would not have taken the trouble to refute them for the hundredth time; and the only reason for my doing so now, is the fact that they issued from the platform of our Literary Society, and were listened to with satisfaction by a number of polite and placid gentlemen, fond of 'the agreeable stimulant,' as Dr. Lankester calls it, and thus likely to accept what the learned Doctor told them, for a good deal more than it was really worth. Authority—even the authority of an F. R. S.—would gain a credit and a currency to which it was in truth not entitled on this subject—all the more because Dr. Lankester avoided the grosser absurdities of our opponents, and re-produced only those plausibilities which were most indefinite in their shape, or most difficult to understand from the complexity of their subject, or the scientific details which they involved. I am not surprized at Dr. Lankester. The medical profession—to which, I believe, he nominally belongs—has been true to its ancient character in opposing the dietetic truths of teetotalism; for it has, in turn, opposed the most important discoveries which have ever been made in medicine and physiology. I recollect that *The British and Foreign Medical Review*, edited by Dr. Forbes, the Queen's Physician, in the year 1843, just after the publication of Liebig's famous work on Organic Chemistry, announced in the usual *ex cathedra* style of the profession, that the new theory quite exploded teetotalism, which must be regarded thenceforth rather as a vulgar expedient than a scientific principle! One unfortunate gentleman—Surgeon Jeaffreson—challenged us to discussion. I met him in the Town-hall of Framlingham; heard him give a bad edition of Liebig's theory to the rustics, which was applauded in exact proportion to its mystery; rose to put a few questions to the learned gentleman, which led him into a chaos of contradiction; whereon, as a last resource, he put on his cloak and hat, and, with umbrella beneath his arm, prudently made his bow and

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—exit! The remarks made on this occasion I published in April, 1843, as an Appendix to my *History of Alcohol*, in which I showed the remarkable accordance of teetotalism with the discoveries in organic chemistry put forth by Liebig and others.

Six years later, after a more accurate study of the theory, I find the *Medical Review* changing (tho not retracting) its opinions; and, in an article from the pen of Dr. Carpenter, admitting that the teetotalers after all *were* right in their version of that theory. Dr. Lankester, however, remains where he was, dealing out the old fallacies of eight years ago as new truths of science! We do not deny the *facts* concerning this question of animal heat, on which he bases his hypothesis, (for theory it is not, but simply *subposition*—*assumption*—that is, his opinion is mentally placed beneath the facts, while in a true theory, the facts underlie and support it); but we *do* question the application and use which he makes of the facts,—we *do* deny the logic of his inferences. It may be observed, in passing, as an illustration of the actual position and claims of the Temperance Reformers, that Dr. Lankester's practical advice on several matters of diet, is equally destitute of novelty with his objections to the teetotal theory. The higher class of our advocates, and our numerous publications, were teaching sanitary and dietetic laws to the people—including nearly all of truth that Dr. Lankester had to say—long before he had ever printed or lectured upon the matter, or before the sanitary gentlemen had published either tract or journal. The fact is, that the Teetotal Society is not merely a system for reforming drunkards, but a vast organization for awakening enquiry, stirring up thought, and diffusing important information among its members. Excuse me if, in proof of this fact, I am compelled to refer to my own connection with this movement,—for it is thus that I know the immense power exercised by this society in educating the people—in preparing the ground for the more complete development of the great sanitary, dietetic, and social truths which are beginning to be recognized in our time. In the *Masham Discussion*, in 1836, I pointed out the 'oneness' of drink in nature, and the adapted variety of food, distinguishing between food which merely fattened, and that which really fed, or nourished, the animal frame. Liebig's discoveries, six years later, explained all this. In 1840, I advocated the use of brown-bread as more nutritious and wholesome than white, showing that the *bird-lime* principle (the fibrine, as it is now called), was not present in white flour, tho clearly so in the entire meal. I also pointed out that fermentation was a destructive and pernicious disturbance of the natural arrangements which prevailed in the constitution of wheat; and, in 1842, in the *Standard Temperance Library*, recommended the unfermented bread, as at once more nutritious and more digestible. Since that time, I have scarcely ever delivered a course of Temperance lectures in Great Britain,—and I have spoken in the largest towns of the kingdom, from Caithness to Cornwall, and from Cumberland to Kent,—without having insisted on these facts, illustrating them by the investigations of the chemists. In 1845, in the *Manx Truth Seeker*, I pointed out a fallacy of two writers in *Blackwood* and *Chambers' Journal*, made in their estimate of the relative value of oats and wheat, as articles of diet—which remark of mine, singularly enough, was substantially reproduced in Dr. Lankester's lectures. It will now, I think, be apparent to you, that however much the ladies and gentlemen, young or old, of the Literary Society might need the illuminating services of our learned opponent, concerning the proper kind of bread, the mysteries of fermentation, and the uses of alcohol, in its bad and good 'forms,' the teetotalers could very well have dispensed both with his chemistry and his criticism. Indeed, so far as *we* are concerned, he was simply bringing bad coals to Newcastle; and, as regards the anti-teetotalers, they, certainly, were in no need of any scientific stimulus to drink!

I shall endeavor, as far as possible, to classify the somewhat loose strictures to which Dr. Lankester gave utterance, under three heads—General, Chemical, and Physiological.

I.

He told his audience that "it was a vexed question amongst physiologists, whether alcoholic drink formed a proper element of diet for man. Teetotalers, said he, "had great authorities on their side—especially one great physiologist, his friend Dr. William Carpenter. Still, they (the physiologists) disagree about the matter; and, in the meantime, the question ought to be left to each person's conscience, to determine for himself"! In immediate connexion with this remark, he very truly observed that "alcoholic drink is an agreeable stimulant."



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This reasoning, as it appears to me, is so ambiguous in its character as to be dangerous in its tendency. Don't you think, gentlemen, that the very agreeableness of the stimulant would be likely to have a disturbing effect on the judgment? Is it not proverbial that our appetites blind our reason? You may always suspect a chain of logic which is closely attached to a liking. If, indeed, the question were to be determined by the evidence of a full and careful experience,—to be settled by the induction of facts only, appealing to the pure intellect, logically trained,—we could have no objection whatever to the statement of Dr. Lankester. Conscience, we fear, has nothing to do with the matter. The advice, practically, would lead to no additional trials and tests of our system; to no further search for evidence; to no careful induction and comparison of facts; but simply encourage the drinker to wait for the distant settlement of the question by the physiologists—satisfied, in the meanwhile, with mis-called moderation in the use of the 'agreeable stimulant.'

The observations of Dr. Lankester, in his second lecture, very naturally excited remarks from the teetotalers who heard him, and especially from two gentlemen who have furnished me with notes of his lectures. Hence Dr. Lankester opened his third lecture by observing that "he was informed that he had been somewhat misunderstood in his remarks on alcohol. He had, indeed, not spoken out so plainly as he ought to have done, from a reluctance to deprive teetotalism of the credit which had been thrown over the system by Dr. Carpenter's treatise."

Truly, this is very amusing, gentlemen, and, I must add, equally conceited. Dr. Lankester, forsooth, will extend his forbearance to our system, because his friend, Dr. Carpenter, has cast his mantle over our imperfections! Permit me to tell him, thro' you and the press, that we do not need his forbearance, and that we challenge his opposition! Let him speak out, therefore, as plainly as he can, and I, for one, shall be prepared to listen, and, I hope, to answer. He has elsewhere given utterance to his stereotyped objections, which whatever may be his intention, are calculated to do far more harm amongst the weak and the fashionable classes, than a bold and honest opposition. Many of you will recollect how, in this hall, fifteen years ago, the late and lamented Dr. Williamson was put forth as the learned and eloquent champion of 'a little wine'; and you will recollect also that we had no very great difficulty in coping with his arguments, which were far more subtle than those of our last antagonist. Since then, both thro' the press and on the platform, we have fought many battles, but never yet cried out for quarter. So late as last year, the drinking-doctors of Newcastle-on-Tyne, Dr. Glover, and Messrs. Potter, Newton, and Larkin, conspired in a ferocious attack upon teetotalism, and in particular against myself and Professor Carpenter. Leaving medicine and physiology, the doctors turned divines also, and treated us with filthy placards, holy psalms, and rabid personality. Yet we had no difficulty in putting them *hors de combat*, and making them ashamed, if not of themselves, at least of their arguments. We have never yet sought forbearance, and we will not accept it now. If we are right we shall be able to stand, if we are wrong we ought to fall. The teetotalers of Leeds, at least, know nothing of mere expediency: we stand upon principle, and the truth will uphold us. Teetotalism does not live upon 'Credit'; it is the expression of the Divine law—of natural facts,—and Dr. Carpenter, I presume, was convinced by the evidence of the pre-existing facts,—he did not *make* them. Teetotalism, as an organized system, had endured and conquered the opposition of thirteen years, had become 'a Great Fact,' before Dr. Carpenter wrote his book. That book, allow me to say, can confer no credit upon Teetotalism; it does not contain a single important truth or principle not already published by the teetotalers themselves, and in a form quite as logical. The essay, however, is very creditable to the heart and head of its amiable author; and is calculated to effect great good, by finding its way, with our facts (and the Prince Albert dedication) into certain classes of society—into literary cliques and conventional circles—whence the simple God's truth of popular Teetotalism would be excluded. The truth is indebted to no man; and it is presumption and pride to talk about any man conferring 'credit' upon the truth.

In the course of the same lecture, Dr. Lankester gave us a specimen of his wit and his philanthropy together. He raised the ready laugh against the poor, ignorant, well-meaning teetotalers, by relating the old story (to which I recollect replying fifteen years ago) concerning the company in London, that 'long, long ago,' employed an apparatus for "catching the alcohol evolved from bread (dough?) in baking." This argument, I

think, is scarcely adapted to catch the teetotalers—it is rather like the bread and company together—stale and bankrupt! What does it mean (if it means anything)? Is it a gentle impeachment, good Doctor, of our consistency? If so, your indictment is very badly worded. In eating bread, however, we do not use alcohol, for you admit that in progress of baking the dough, the spirit is evolved *from* it, and therefore does not remain *in* the bread. But the doctor deplors the waste of the food involved in the fermentation of the flour, and recommends the people to use unfermented bread, as we have long done ourselves. He deplors also the prejudice which leads to throwing the husk of the bran out of the meal destined for bread, and giving it to the cattle. But what did the philanthropic doctor say concerning the enormous waste of precious human food (which leads to ‘dear bread’) involved in the conversion of the produce of ten-million-acres of land, in the shape of fruits, grain, and roots, into beer, wine, brandy, gin, rum, and so forth? Nothing—not one word—against the wholesale destruction of food involved in the manufacture of the ‘agreeable stimulant.’ His ‘benevolence’ would not suffer him to impeach the ‘Bottle.’

II.

DR. LANKESTER, in treating of the chemistry of fermentation, observed that, “altho the elements of sugar and alcohol were the same, but combined in different proportions, they possessed very different properties, and produced very different effects,”—an admission, one might have thought, that would suggest the question—If the God-created sugar be right, why does man convert it into so very different a substance? But Dr. Lankester goes on, without stopping, to say that “alcohol belonged to the same class of substances as sugar—substances which increased the heat of the body”! I shall consider this last allegation by-and-bye; I only stop to say, that this sort of classification is far too loose and general to be satisfactory, and indeed is practically deceptive. I deny that alcohol is properly included under the head of *dietetic substances*, such as sugar—since, in the Divine arrangement, such substances must fulfil two adaptations—first, their *chemical constitution* must be right; and, second, their *physiological properties* must be in harmony with the end of their chemical structure—namely, to sustain or increase vitality. This, however, is not the case with alcohol; for, while oil, sugar, etc., are neutral and innocent in relation to the living tissues, alcohol is acrid and stimulant—that is, produces an exhaustive re-action. Alcohol possesses very different properties from natural food; and no wise person would, therefore, use it to answer the same purpose.

Dr. Lankester admits that “alcohol in the form of spirit, renders persons liable to disease of the mucous membrane, which must cause premature death;” but, “in fermented liquors, the alcohol and the water were chemically combined.” Dr. Lankester, in his third lecture, attempted to explain this singular statement—which, after all, is but the turning up of a sedimentary deposit of twelve years ago. Alcohol, according to him and his syllabus, has a Protean existence; it is food to-day, it is physic to-morrow; it is fuel, and it is fluid; it is poison, and it is aliment; it is a type of such substances as sober-sugar, and also “an agreeable stimulant” that will intoxicate. In short, gentlemen, it has many ‘forms’;—according to our learned instructor, “alcohol is something more than a mere stimulant—altho it could not as yet be distinctly defined”!!

I answer, that this pretended philosophy is pure blundering, contradicted by the clearest principles of chemistry, and the most obvious facts of physiological science and life. Do you not daily see the same effects produced upon men by beer and porter as by ardent spirits? Do they not all intoxicate? Do they not all paralyze the nerves, and affect the breathing and the brain? Was it not “alcohol *in the form* of wine,” which the drunkard of Solomon’s day was in the habit of consuming? And is not this the language put into his mouth, when represented as rising from his debauch?—‘They have stricken me, but I felt it not.’ Is not the beer-drinker’s blood dark-colored or carbonized, as well as the gin-drinkers? Do they not both ‘reel and stagger as drunken men’? Will not wine and beer produce ‘redness of eyes,’ and inflammation—chronic inflammation—of the mucous membrane? I know it will, for I have seen it. (Dr. Hun, an old opponent of teetotalism, confessed that even the use of the light wines of France *is* followed by such appearances.) What were found to be the facts in that remarkable case of the living man, San Martin, into whose stomach Dr. W. Beaumont had the opportunity of looking? He distinctly

states that "the whole class of alcoholic liquors, whether simply fermented or distilled, produced very little difference in their ultimate effects on the system" (p. 50). The question between one kind of alcoholic liquor and another is only one of degree—not of kind; and the state of disturbing reaction (called 'stimulation') into which the heart, the lungs, and other organs are thrown after the use of wine, beer, and spirits, proclaims that they equally belong to the class of unnatural agents,—or poisons which waste the vital force and impair the structures thro' which it acts.

Chemical facts are equally conclusive against the undefinable distinction set up between alcohol *in* wine, and alcohol *out* of wine. Alcohol is an antiseptic—a pickling or preserving agent—and hence very unlike water, which is the great dissolver of solids, and the vehicle of their vital movement. This property is the same in kind, both in wine and in brandy. Meat can be pickled in either,—the alcohol in both opposing the change of matter. Water, indeed, can modify the action of alcohol—that is, can oppose, or sheathe, its acrid, its destructive, or its preserving properties; but, *as far as it operates at all*—that is, in proportion to its power as a stimulant—it operates essentially the same, whether in one mixture or another. It is never transformed from poison to food; from an agent with intoxicating, to an agent with innocent or dietetic properties. To render his argument of any force, Dr. Lankester must bridge this gulf—a work that will far transcend his dialectic skill.

Professor Brande, an F.R.S. of higher celebrity, shall answer Dr. Lankester. Before citing the passage from my *Chemical History of Alcohol* (1844), I must observe that alcohol and water are *not* 'chemically combined' in wine and beer. In every true chemical union (as distinguished from interfusion, mixture, or cohesion), the result is a new substance,—that is, a form of matter possessed of properties different from the substances united. Now, as I have shown already, this is not the case with fermented liquors, which possess the same essential characteristics as the spirit and water (for brandy is half water) distilled from them. Dr. Lankester, however, seems to think, and his theory necessarily implies, that by the heat in distillation the *innocent watery-alcohol* (so that, after all, it is owing to the water that our vinous friends are safe!) is transformed, or unrobed, into *raw, acrid spirit!* Professor Brande says:—"Inasmuch as I can obtain the same quantity of alcohol by distilling wines at very low as at very high temperatures, and as I can get the full complement of alcohol from the stronger wines by the action of carbonate of potash, which abstracts water and separates alcohol without any distillation or other interference of heat, we must not allow those who indulge in wine to

'Lay this flattering unction to their souls,'

or to use any such argument in opposition to the teetotalers."

Dr. Lankester informed his audience that "Alcohol was formed by a natural law, and was a type of other substances existing in nature."

In what respect, gentlemen, is alcohol a type of other substances? I have shown that it is no type of natural fuel food, for its properties are diverse. Is it meant that it is a type of the natural narcotic poisons? If so, the answer is plain—we are not discussing the utility of drugs, but a question of diet; and, moreover, if we already have similar things in nature, why need we make these by a costly process of art?

Dr. Lankester said that "alcohol is formed by natural law." I should like to know what he really meant, or meant his hearers to infer? Does it need an F.R.S. to inform a Literary Society that nothing is formed by chance, and therefore everything by law? Or is there some *unnatural* law operating in Chemistry? and does our learned critic wish us to understand that alcohol is formed by the natural law, not by the other? Of course, gentlemen, alcohol is formed by natural law. But, what then? Guns, and pistols, and cannon-balls are also formed by some law, and I know only one source of power or law. It is according to a *law of cohesion* that melted lead and iron are converted into balls, and according to a *law of projection* that balls are sent out on their deadly errands. It is according to a law that salt-petre, charcoal, and sulphur unite to form gunpowder. It is by a law that its explosive power is manifested in discharging a bullet, and by a law that men are slain. What then? Does Dr. Lankester mean to put off the responsibilities of man in these matters, and charge them upon Nature? If not as respects the uses to which men put the inorganic elements of the universe, why as respects the conversion of divinely organized food into a drink that has destroyed more bodies and souls than war

itself? Our responsibility is *founded* upon the very fact that *the power of natural law is available to us*, for good or for ill; and therefore can furnish no excuse for the abuse or misdirection of that power in transmuting wholesome food into intoxicating drink.

III.

ON the physiological portion of our subject Dr. Lankester had some curious and critical objections to urge, and some very apocryphal facts to announce. Amongst the latter I note the following:—

“Alcohol is a type of other substances existing in nature, and INDEED is REQUISITE for man as a stimulant”! Of course, unless Dr. Lankester meant nothing to the purpose of his argument, he meant that Alcohol was necessary or requisite to man’s health. Yet, gentlemen, many of you have somehow contrived to do without this requisite for many years, and to trouble the doctor quite as little as your neighbors. Nay, the fact is, that a great part of the human race always *have* gone without alcohol, and yet I do not know that the pure Hindoo, the Mohammedan, New Zcalander, or South-Sea Islander, were physically any the worse for it. The proposition, besides, is opposed to our clearest conceptions of the perfection of Nature in such matters as these—to the Divine attributes, in short. He whose wisdom is displayed in the beautiful adaptations of food and drink to the wants of all his creatures, CANNOT have left Man destitute of an element essential to his health; and yet alcohol is *not* provided for us, as food, ready formed in Nature.

Another argument of Dr. Lankester suggests that he may mean that alcohol is *occasionally requisite*, tho’ not habitually. He informed his audience that “condiments, such as *pepper, mustard*, etc., were *necessary* in order to rouse the stomach. Animals that had been stall-fed for a time, would, when first turned into the field, eagerly seek for various herbs of a stimulating character.”

I notice, in the first place, that the conditions here mentioned are not those of health—but of a departure from health. Unless we violate dietetic laws, the stomach will rarely want ‘rousing’ with pepper or mustard; and I do not propose that men should be ‘stall-fed,’ or live without exercise and fresh air. In the second place, however, let us assume that such must be the case; what then? If pepper and mustard (things I do not take) will answer the end, where is the need of alcohol? The fact assumed—that Nature HAS made such a bountiful provision for occasional wants arising from unavoidable evil conditions,—tends rather to show that alcohol is not needed,—unless Dr. Lankester thinks Nature omitted it in her list from an oversight? The power that has so amply provided the ‘various herbs’ for cattle, would not, I think, overlook the wants of man. Besides, it is very doubtful whether Dr. Lankester has read his facts aright. The experiments of Dr. Beaumont upon San Martin, demonstrated that ‘condiments’ were pernicious, and did not help digestion, and the experience of thousands of teetotalers who abstain from them, both in health and disease, show that they are not ‘necessary.’ As regards the herbs which the cattle seek out, that may simply arise from their having had food supplied to them of an improper kind,—food not containing *all* the elements needed,—and, at any rate, it is not proved that the herbs are taken as a ‘substitute’ for alcohol, or as a pure stimulant. ^a

Dr. Lankester admits that “spirits, whether neat or diluted”—that is, whether half-water, or more than that—“are decidedly objectionable as articles of diet, but as medicines they are useful in some instances.” This, therefore, allows that the basis of such drink is essentially bad, and distinguishes between the medical and the dietetic question. He gave, also, a novel description of the result of spirit-drinking:—“The water,” says he, “is soon taken up by the absorbent vessels, and the PURE SPIRIT IS LEFT BEHIND IN THE STOMACH, to act with full force upon it”! It is certain, however, that tho’ it inflicts

^a Riding out upon the Cleveland Hills in the early part of summer, I observed the horse in our gig, and one in a cart, eagerly consume the *dust* of the road. On examining the nature of the earth, I found it to consist mainly of *carbonate of iron* and *alumina*. Apparently, some ‘medical’ instinct leads the brutes to the rare and occasional use of this earth—shall rational Man, carrying out the Lankestrian philosophy, *infer* that dust is therefore diet?

harm enough there, it does pass on into the system, and may subsequently be found in the blood and the secretions and excretions—save the portion that becomes decomposed by its union with oxygen in the blood. Indeed, it is the matter of the nervous centres for which alcohol has the most apparent affinity—not that of the stomach—and there is no reason whatever for asserting that it disunites itself with the water of the vital tissues. It will unite with *all* the water it meets with, equally, and this tendency to unite with the essential water of the vital-tissues (or, in other words, to absorb it) creates the local reaction called *inflammation* and *redness*.

Notwithstanding distilled alcohol is admitted to be so bad, the undistilled is somehow a very ‘good creature’! Nay, according to Dr. Lankester, neither of them are poisons, though spirits are very bad. “*Intoxicating* liquors ought not to be denominated POISONS.” Well, gentlemen, if our learned critic will be nice, we can have no objection. We only wish to be accurate, and, therefore, I do not say that alcoholic wine, including the good water, is a ‘poison,’ but that it is *intoxicating* (from the Greek *toxikos*), that is, POISONOUS. If you wish for further explanation, then I say, poison is a thing of *quality*—the physiological power of disturbing normal action or structure,—and is therefore applied to a class of effects varying widely in degree, tho not in kind, from the sting of a bee to the bite of a rattlesnake. If spirits are not food, nor indifferent like sawdust, then they are poisonous, or, in other words, poison diluted. And the same must be asserted of fermented drinks, *just so far* as they disturb, or tend to intoxicate, the system of man.

But Dr. Lankester “disagrees with his friend Dr. Carpenter, when he argues from the fatal effects of a large dose of an alcoholic stimulant, against the use of a moderate^b [meaning a lesser] quantity. For instance, one pound of salt would kill any one, but it did not follow that ten or twelve grains would injure or poison.”

This argument is borrowed from the *Lancet*, and other medical journals, where some writers thought themselves very clever in employing it to evade the conclusions drawn by the teetotaler from the fact that pure alcohol is essentially an acrid and corrosive poison in its topical action. It is indeed an attempt, gentlemen, in imitation of the juvenile method of catching birds. Dr. Lankester, relying on a popular fallacy regarding salt, would catch the Teetotaler by putting a little upon him—but I suspect he will find the difficulty is in the preliminary process. I, for one, shall certainly not suffer him to put the salt upon my theory, under the idea that it is a good thing—nor to draw his conclusion on the principle that ‘two blacks make one white—that the assumed virtue of salt disproves the asserted evil of alcohol. The fact is, I do not believe in salt; nor shall I do so until I have better proof of its dietetic utility than the traditional and worthless story of its absence breeding worms in Dutch criminals a long while ago. Since autumn last I have enjoyed better health than for many years past, and have nevertheless abstained from salt; while I know many persons enjoying excellent health who have not used it for years as diet—tho once or twice as medicine. The experiment of the homœopaths to ascertain its real effects in small doses, show that it is a very injurious article when frequently introduced into the system.^c The illustration selected by Dr. Lankester, therefore, is by no means so happy as he imagined it to be. If a person take any article, he may be killed either by its quantity or its quality. Two pounds of beef might kill by its quantity—i.e. by its bulk and pressure arresting the vital functions—but who could say that such would be a case of poisoning? Killing is not poisoning, tho poisoning may be killing. Having made this distinction, I now proceed to put Dr. Lankester’s proposition anew: but with a different conclusion:—“If one pound of salt kills a person by virtue of its acrid properties, then it *does* follow that every ten grains of salt contained in the pound, did *some of the injury* which, on the whole, proved fatal.” Nor can Dr. Lankester escape this inference save by affirming that one part of the salt had no effect at all, or a very different

^b The words ‘*temperate*’ and ‘*moderate*,’ are equally incorrect, when applied to a practice which is unreasonable or bad. It is time teetotalers ceased to concede their use to the opponent.

^c I know of several cases where its free use seems to have been concerned in producing spinal complaints and epileptic fits. Taylor, in his chapter on *Poisons*, classes salt under that head.

effect from some other part. I affirm the same of alcohol as of salt. If a quart intoxicates or poisons a man, a glass does something *of the same kind* towards that end. In other words, there is no alteration of property or quality between the first and the last glass of wine or between the first and the last grain of salt.

Lastly, Dr. Lankester announced to his audience that "alcohol had *heat-producing* properties." If by that he meant that when burnt, in the body or out of it,—in other words, that alcohol gave forth heat like other decomposing things, as a sweating stack or a manure heap,—he was of course, if not monstrously wise, at least moderately accurate. Here, at last, we come to the theory of Liebig, and its relations to teetotalism. Before proceeding to consider this theory, however, I must briefly demonstrate the harmony of teetotalism with the natural laws, and explain the processes and structures of life.

[DR. LEES then proceeded with his exposition of the organic nature of man, the laws of life, and the adaptations of diet to the wants of the human economy. The body was defined generally as an organ of action, and the various systems and functions were described as a living organism, that is, as characterized by *warmth* and *movement*. But heat radiates, and substance is worn down in acting. Thus the body in every part is perpetually subject to change, to wear and tear—hence the loss of *heat* and of *substance*. Food is the material adapted to restore this twofold loss, and is therefore of two kinds, *viz. fuel-food* to warm, *nourishment* to build up. The substances prepared by nature for *fuel-food* to the living house are oil, starch, gum, sugar, and cellulose, adapted to the various seasons and climates—those for *nourishment* are fibrine, albumen, and caseine, containing the various elements of the body and its tissues, in a solid form capable of assimilation. None of these substances have intoxicating or acrid properties; all are soothing or neutral in their physiological relations; and it must be confessed that all these 'good creatures' are accepted by the teetotalers, whose practice, thus far, is in clear harmony with natural arrangements. While food has two purposes to subserve, and is therefore of two sorts, drink has but one end to answer—that of a vehicle of movement or circulation; and hence in nature we have but one drink—literally 'the *water* of life.' Dr. Lees proceeded to consider the possible uses of alcohol as an element of diet. Alcohol could not be used as a fluid in the place of water, because it possessed diametrically *opposite* properties; it prevents digestion, it solidifies albumen, it stops the circulation. Alcohol was not nourishing food, since, in the first place, it was destitute of solidity, and could not, therefore, 'stick to one's ribs'; and, in the second, it wanted the greater number of the essential elements of the tissues—as nitrogen, phosphorus, lime, sulphur, iron, etc., all of which must co-exist, and in a particular combination, to constitute nourishment.]

DR. LANKESTER, in advocating the 'heat-producing properties' of alcohol, pretended that Liebig supported his views, "who ought to be regarded as an authority as great as Dr. Carpenter;" and contended, further, that "persons recovering from indisposition, who could not take [digest?] starch and sugar, would find alcohol [which only needs to be absorbed] to serve the same purpose."

Now, gentlemen, I don't think that you will be disposed to have a matter of this kind settled by the 'authority' of any man, but will unite with me in demanding the reasons for the opinions of either Professor Liebig or Professor Carpenter. I am thankful to both those gentlemen for many important facts which they have stated, but I also know that they are no better logicians than their neighbors; and, indeed, Liebig, with a noble frankness, has confessed to several erroneous inferences from the facts stated in his earlier works. But I think, on this special point, that Dr. Carpenter has read the facts of Liebig better than Dr. Lankester, and I will attempt to show you why and wherefore I think so. Let me, however, here again protest against confounding together cases so distinct as those of health and disease. Of course, if a person be placed in such circumstances that he cannot be supplied with ordinary and proper fuel for vital heat, in a proper way, rather than permit him to die, it will be justifiable to give him extraordinary fuel that serves the needful end, even tho' it does so badly, and in an unnatural manner. Amputation is good when an injured limb is mortifying; but is it, therefore, good to lose a sound limb?

We must, then, fall back upon the old question, "Can the use of alcoholic drinks be justified as an article of ordinary diet?" I deny that Dr. Lankester is in possession of a

single fact, derived from Liebig or any body else, that would justify an affirmative answer.

He stated, indeed, on the authority of Liebig, that "those who abstained from alcohol required larger quantities of starch and sugar, etc."

1. I admit the fact, but I deny the inference. A man who chews or smokes tobacco will require less food than if he abstained. But why? Not because tobacco supplies the place of fuel, or makes him really warmer, but because it is a narcotic and antiseptic, and thus opposes a change of matter—*i. e.* lessens life, and therefore wear and tear. A man who sleeps with his bed-curtains closely drawn, and inhales little oxygen and a good deal of foul air, will want a lesser breakfast than if the normal amount of vital action had gone on in sleep. But why? Not because carbonic acid supplies the place of food, but because it prevents the change of matter, and lessens vitality. In the same way, alcohol narcotizes the human blood, or, to translate the facts stated by Liebig from the technicalities of chemistry into a formula you will all understand, Alcohol *robs the blood of oxygen*^d—of that element of fresh vital air which nature designed to unite with the prepared elements of the fuel food or the metamorphosed and waste matter of the tissues. Hence, as demonstrated by the experiments of Prout, Fyfe, and Vierordt, on measuring the quantity of carbonic acid exhaled from the lungs after the use of alcoholic drinks, it was found to be lessened for many hours; thus showing that waste matter had been retained in the system, unburnt up, and the vital stream consequently defiled.

2. However, even if the use of alcohol did warm the body as a kind of fuel, there would be several fatal physiological objections to its use. As a nervine stimulant it wastes the vital force, as an acrid and corrosive poison it injures or inflames all the tissues it touches, and as a chemical agent it deprives the blood of a needful purifying element, *using up for its own decomposition that which was intended for a distinct and different purpose*. It cannot be wise, therefore, to use as a chemical article of fuel that which first sets fire to the house, which lowers the vitality of the inhabitant, which keeps the living current unventilated, which injures the most delicate and important structures, and, in short, lowers the whole tone of the system.

3. It is very true, that as a mere element of fuel, a certain weight of alcohol would give out a greater amount of heat than starch and sugar. But Dr. Lankester here acts the part of a partial or ignorant judge—he misdirects the jury, who in this case are no wiser than juries generally. The human body is not a mere furnace for fuel, but a delicate and living organism. The fuel is for the body, not the body for the fuel; and hence we must wilfully admit nothing within its living structure that would injure, disturb, or destroy. Moreover, we are not bound to use starch and sugar merely. If comparisons are to be drawn, we must not exclude any of the natural articles; we must not select that fuel in regard to heat-producing-power which is lowest, and exclude that which is highest, as Dr. Lankester has done. Compare the innocent and cheap oil (and we have always oil, or fat, in the human blood, prepared by the liver) with the dear and acrid alcohol, and we shall find a decided advantage in the natural over the artificial, the innocent over the noxious. Where, after poisoning the organism first—alcohol would keep up the heat of the body for 65 hours,—the same weight of oil would keep up the heat for 87 hours! Or to change the form of illustration, where a given amount of alcohol would, being burnt, raise the temperature of 9,000lbs. of water one degree, the same weight of oil would raise the temperature one degree of above 12,000lbs. of water! If, therefore, gentlemen, you would warm your water, both cheaply and well,—in short, boil your kettle without burning it,—you must avoid alcohol, and accept the innocent and natural element provided for you by the All-wise. Depend upon it, Nature understands this question much better than any F.R.S.

4. Experience—with which all true science must harmonize—confirms my position. Here we have overwhelming testimony, from persons who have tried the two systems in the most severe climates. William Cobbett, M.P., speaking in 1819 of his experience of the severe winters of Canada, says:—

"It is said, as an excuse for the use of spirits, that they keep out the cold. Let a man

^d One frequently borrowed from Dr. Lees's writings without acknowledgement: as in W. Lovett's excellent book on *Physiology*, and elsewhere.

once persuade himself of that, and he will soon find that they keep off the heat! That they drive out the heat is very certain; for in the northern parts of America, where the cold is so great that people are frequently frost-bitten, and are compelled to have their feet or hands cut off, it is a caution always given to those who are likely to be exposed to the severity of the weather, not to drink any spirits before they go out. And, tho I have known many persons frozen to death, and a great many more to have their limbs cut off, I hardly recollect a single instance in which the suffering party had not taken spirituous liquors on his way, or before he went out. I have a hundred times gone out shooting or hunting upon the snow along with others, each of whom took a canteen of rum, while I took none. I used to suck the snow, which they told me would give me the pleurisy; but I found that I never had the pleurisy, and that many of them had. And as to ability to travel and bear the cold, tho many of my companions were much stronger and more active than myself, I always found that, at the end of the day, I was the freshest, and by far the most cheerful of them all."

Dr. Scoresby, in his evidence before parliament, and he had been engaged 21 years in the whale fishery,—in reply to the question, "Then you conceive it to be a fallacious opinion that spirits are necessary in cold climates?"—answers, "Certainly; they are decidedly injurious." Cooper, the American writer on naval matters, speaking of the sealers beyond Cape Horn, says—"Coffee is better, any day, than all the rum and whisky ever distilled." Mr. Dana, the author of *Two years before the mast*, says:—"I never knew a sailor in my life who would not prefer a pint of hot coffee or chocolate on a cold night, to all the rum afloat. They all say that it [the rum] warms them only for a time." You are all familiar with the important fact, that the men engaged in the recent Arctic Expedition were ordered to abstain. Dr. Sir John Richardson, as the result of his experience in the frigid regions of the North, says:—"I am quite satisfied that spirituous liquors diminish the power of resisting cold. Plenty of food, and sound digestion, are the best sources of heat?"

5. Nay, gentlemen, even the very instinct of nature—the voice of God, as it were—declares that we are right. Sailors who went out accustomed to their grog,—who, in ordinary circumstances and climates would mutiny if deprived of it,—there experienced an alteration of their tastes. "Wine, or spirits," says Sir John Richardson, "we soon ceased to care for, while the craving for tea increased." Thus also, very often, consumptive patients using the Cod-liver oil, acquire a *distaste* for wine—the use of those substances being incompatible when circulating in the blood. Nature *prefers* the innocent oil to the artificial spirit.

6. I am aware of an attempt to evade the force of one set of facts to which I have referred you—the diminution in the quantity of carbonic acid after the use of alcohol, and its great subsequent increase, showing that the system was ridding itself, as fast as possible, of the waste matter which the use of alcohol had kept in. It is a very poor attempt, indeed, for it only meets one half the case; it consists in the allegation, that tho less gas is breathed out, more vapor is exhaled thro the skin, owing to the alcohol containing more hydrogen tho less carbon than natural food. I answer, that matters not on the whole, since it is certain that oil does give out, when burnt up, more heat than alcohol, and therefore, as the given quantity of oxygen inbreathed can not use both substances at once, in the fact of uniting with the less valuable (not to say poisonous) fuel, the body must be less warm. This agrees with the test of the thermometer—and certainly the mercury will not lie for any hypothesis—whether of Lees or Lankester. Dr. Davy, F.R.S., in his experiments on the Temperature of Man, found that even three glasses of wine perceptibly lowered the heat of the body; while after four or five glasses the reduction was most strongly marked.

Gentlemen, I have now done with the fallacies of our last opponent. I should have been glad if he were present to answer for himself. We do not fear discussion, we invite it; for we feel that we are right, and that we occupy the Vantage ground of Truth. Let our opponent, then, forget his 'tender mercies,' for we do not need them. The Tree of Temperance, we believe, like the mystic *Igdrasyll* of our Scandinavian ancestors, has its roots in the Divine Life and order of the Universe, and the more fiercely the winter tempests of opposition may sweep against it, the more deeply will it strike its roots into the soil of the Eternal Truth, and in 'the good time coming,' put forth a fairer and a fuller foliage, and extend a more refreshing shade and protection to the generations that shall follow us.

NOTE ON PROFESSOR CARPENTER'S ESSAY.

A medical friend who saw the Newspaper Report of the preceding address, has directed my attention to a discrepancy between the statements of Baron Liebig cited in my lecture, and a passage in Dr. Carpenter's Essay on Alcoholic drinks. We need only observe, here, that in statements concerning the most recent *chemical facts and experiments*, I shall unhesitatingly (in the absence of positive evidence) prefer the authority of Liebig to that of any mere amateur or writer, or any second-rate chemist.

The Essayist (§. 111-113) makes the heat-producing power of alcohol compared with oil, as 378 to 394. This reduced to a lower proportion, leaves the matter thus:—

Alcohol to Oil (*according to Liebig*) is as 65 to 87.
Alcohol to Oil (*according to Carpenter*), say, 65 to 68.

Now, says Dr. C., this difference between 378 and 394 (or 65 to 68), is *more than compensated for* by the combustion of *oxygen with hydrogen giving out more heat* than the combustion of oxygen with carbon. "Considered, therefore, in the light of *fuel* [simply], Alcohol is *superior* to oleaginous substances.—A *spirit lamp* gives more heat than an *oil lamp*."

This last illustration would alone make us *doubt* the accuracy of the main statement, for in the case of the Spirit lamp, the fuel may be *more rapidly* combustible simply because of its tenuity or the adaptation of the lamp? Of two specimens of coal, as of two sorts of oil,—or of one grate or lamp as compared with another,—the same may be said in a rough way. The heat, in the same space of time, owing to *several* conditions, may vary, without at all proving that (*the conditions of combustion given*) a certain weight of pure oil will not produce *as much* heat as the same weight of spirit. Now Experience has shown that *these conditions of combustion* for supplying the normal heat to the body, *do* exist in the case of oil—in short, that the body is constructed as an *Oil-lamp*, and *can* burn up oil *fast enough*. When chemists have got so *good* a lamp, the comparison will hold, but not before.

The statements of Dr. C. seem opposed alike to the experiments of Dalton, Despretz, and Liebig. The great English Chemist states, that, "generally, the combustible gases give out heat *nearly in proportion to the oxygen they consume*." If the law holds good of carbon and other substances, then oil must have a decided advantage over spirit, since, according to Turner, 90 parts of Oil consume 272 parts of Oxygen, where alcohol consumes but 222—a difference of *above a fifth*. According to Liebig, where 1lb. of alcohol consumes 362 volumes of oxygen, 1lb. of Fat consumes 511—thus showing it to be also the *best protector* of the body by using up the extra amount of oxygen inbreathed in cold seasons. Further, Despretz's experiments led him to conclude that, in burning, (equal quantities of oxygen being assumed) *hydrogen evolves less heat* than most other substances. When the combustion of *hydrogen gas* produced 2578 degrees of heat, *carbon* gave out 2967.

With these facts and statements before us, we very respectfully dissent both from Prof. Carpenter and Dr. Lankester, and while referring them on this special point to Baron Liebig for satisfaction, we must repeat our proposition—that the theory of Organic Chemistry as propounded by the great German *thus far*, is in perfect harmony with the theory and experience of Teetotalers.

F. R. L.

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